DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service
Agency for Toxic Substances
and Disease Registry

Memorandum

Date: August 11, 1988

From: Assistant Director for Health Assessment Coordination
Office of Health Assessment

Subject: Final Draft Preliminary Health Assessment:
Cherokee County-Galena Subsite, Galena, Cherokee County, Kansas

To: David Parker
Public Health Advisor
EPA Region VII

Enclosed are two copies of the final draft Preliminary Health Assessment for Cherokee County-Galena Subsite prepared by Greg Ulirsch. We have received and taken into account your comments in the current final draft. Would you please forward one of the enclosed copies to the appropriate EPA official with a request that he or she provide written comments to you within three weeks (by September 12, 1988), which you can in turn provide to me. If we do not receive Regional Office comments by the due date or are not otherwise notified that they are being prepared, we will assume that the draft is acceptable as is and will proceed with finalization in the present form. We appreciate your cooperation and assistance, especially during this transition period as we implement the new Communications Procedures.

Stephen D. Von Allmen

cc:
George Buynoski

Health Assessment for

CHEROKEE COUNTY-GALENA SUBSITE NPL SITE

GALENA, CHEROKEE COUNTY, KANSAS

AUGUST 9, 1988

PRELIMINARY HEALTH ASSESSMENT

Cherokee County-Galena Subsite NPL Site
Cherokee County
Galena, Kansas
August 9, 188

Prepared by:
Office of Health Assessment
Agency for Toxic Substances and Disease Registry (ATSDR)

Background

The Cherokee County site is listed by the U.S. Environmental Protection Agency (EPA) on the National Priorities List (NPL). The Galena Subsite is one of six subsites designated by the EPA within the Cherokee County NPL site. The Galena Subsite boundary is located in the southeast corner of Cherokee County. The subsite encompasses about 18 acres around the City of Galena, Kansas. Mining for lead and zinc ores and smelting operations, in the Galena area, began in 1876 and 1890's, respectively. Mining and smelting activities ceased in the 1929's and 1960's, respectively. During this period, mine wastes resulting from shaft excavations, ore milling processes, and smelter operations have been disposed of on the ground near mine shafts and former mill sites. About 1.5 square miles of land in the Galena Subsite are covered with mine wastes. In addition, mine wastes have been left in underground mine shafts. Access to the contaminated areas are not restricted.

The land uses in the Galena Subsite are residential, commercial, light industrial, agricultural and livestock land, scattered woodlands, and abandoned mine land.

Elevated levels of heavy metals were found in shallow private drinking water wells (see Environmental Contamination and Physical Hazards Section below) at the Galena Subsite during the 1985-1986 sampling. Subsequently, in 1986, the EPA installed individual household treatment units at those residences that had drinking water samples that exceeded primary drinking water standards. Before and after monitoring of the well water was completed to evaluate the operation of the treatment units. In addition, because of the contamination found in the Galena private wells, a site-wide (Cherokee County) water supply inventory and monitoring was initiated in 1987 for private wells and municipal wells.

The following documents were provided to ATSDR for review: Final Draft Phase I Remedial Investigation Report for Cherokee County Galena Subsite, April 23, 1986; Final Draft Alternate Water Supply Operable Unit Feasibility Study for Galena Subsite Cherokee County Site, November 4,

1987; Final Technical Memorandum Site-Wide Water Supply Inventory Cherokee County Site, November 25, 1987; Final Draft Groundwater and Surface Water Operable Unit Feasibility Study for Galena Subsite Cherokee County Site, February 26, 1988. These documents form the basis of this Preliminary Health Assessment.

Environmental Contamination and Physical Hazards

Contamination in the on-site areas consists of lead [3,880 ppm in surface mine wastes, 500 ppm in surface soils, 390 ppb in private drinking water wells, 290 ppb in surface water from subsidence or open pit mine ponds, 67 ppb in other surface waters (creeks or rivers)]; cadmium [60 ppm surface mine wastes, 12 ppm in surface soils, 180 ppb in private drinking water wells, 200 ppb in surface water from subsidence or open pit mine ponds, 140 ppb in other surface water (creeks or rivers)] and; chromium (total) [120 ppb in private drinking water wells]. The City of Galena municipal drinking water wells were monitored for heavy metals; lead and cadmium were not detected. Lead and cadmium were not detected in fillet samples from game fish, however, elevated levels of lead and cadmium were found in whole fish samples from forage fish in local surface waters.

Open mine shafts or tunnels and areas of current or potential ground subsidence may pose a physical hazard to children or adults who play or recreate in these areas. In addition, some of the subsidence areas are partially or completely filled with water which may increase the physical hazard posed by these areas.

Potential Environmental and Exposure Pathways

The Potential Environmental Pathways at the Galena Subsite are:

1. Surface and ground waters move through the surface and underground mine wastes which creates acid mine drainage. Dissolved heavy metals in the acid mine drainage are then transported from the contamination source via surface and ground water to the Spring River (and eventually downstream to Oklahoma), Short Creek, and Shoal Creek. Most of the drainage from the source contamination to the Short Creek is via the Owl Branch tributary.

2. The natural hydrogeology of the subsite area has been extensively altered because of the years of mining activities. The ground water flow patterns are controlled by faults, fractures, mine workings, shafts, and tunnels which act as preferred conduits for water flow. Hence, because of the unpredictable ground water flow patterns, all private/municipal wells (especially well completed in the shallow aquifer) in the Galena Subsite (and Cherokee County Site) have the potential to be contaminated with site-related contaminants.

3. Air emissions from the former smelter could have transported lead contaminated particulates to residential and public areas located around the former smelter operations. In addition, heavy metal contaminated fugitive dusts can be entrained into the air media and transported away from the source areas to potential receptors.

4. Given the extensive mining activities in the past, the potential for the significant release of radon gases from the subsurface into the air media does exist. In addition, these former mining wastes could contain radionuclides which can be transported in the ground water or surface waters away from the source areas.

5. Fish from the creeks and rivers in the subsite area have the potential for bioaccumulation of heavy metals in their tissues. In addition, bioaccumulation may occur in plants grown on contaminated soils or irrigated with contaminated surface or ground waters, livestock and their products which are fed potentially co-taminated plant materials and/or watered with contaminated surface water, or other identified local consumable plants and animals.

Given the potential environmental pathways above, the potential human exposure pathways of concern are:

1. Ingestion of soil or mine wastes by children or adults playing or recreating in contaminated areas.

2. Ingestion of contaminated household dusts.

3. Inhalation of dust-entrained contaminants or radon gases (see Evaluation and Discussion Section below).

4. Dermal exposure to contaminated soils, mine wastes, and/or contaminated surface water.

5. Ingestion of contaminated surface water while swimming.

6. Ingestion of potentially contaminated foodstuffs.

7. Ingestion of contaminated ground water from any private wells still using their wells for drinking water purposes.

Demographics

The City of Galena has a population of about 3,588 persons (1980 census). An estimated 1,050 persons live outside the City of Galena in the Galena Subsite area.

Evaluation and Discussion

The Cherokee County Site, in its present state of contamination, poses a concern to public health. Lead and cadmium in soil, surface water, and ground water, are found at levels that are a public health concern. Children are the main sensitive subpopulation of concern, because of their potential exposure to contaminated soil and surface water. Lead is absorbed via the gastrointestinal tract more efficiently in children than in adults (Casarett et al.,1986). Chronic low-level exposure (oral) has been known to result in irreversible central nervous system (CNS) dysfunction and adverse neurobehavioral effects. Because lead and cadmium have very similar toxic effects in multiple organ systems, each may be considered to potentiate the toxicity of the other resulting in possible additivity or possible synergistic effects.

If any residences are using ground water for drinking or domestic purposes, these individuals may potentially be exposed to cadmium and lead through ingestion of or dermal exposure to the ground water, which may adversely affect their health.

Since access to the subsidence areas and the mine tunnels and shafts is poorly restricted, the potential exists for serious physical injury or death as a result of falling into one of these open tunnels (shafts) or subsidence areas. This is of particular concern for persons engaged in recreational activities (e.g., hiking, exploring, dirt bike riding) in the area. In addition, the potential exists for serious injury or death as a result of structural collapse on persons entering these areas.

The acidity (low pH) in many of the surface waters and acid drainages may pose a potential for ocular irritation following exposure to these sources. Since dermal injury is dependent on both the pH and ionic makeup of the exposure medium, the potential also exists for dermal irritation or damage as a result of such exposure.

No data for radon gas monitoring for enclosed houses or other buildings was provided in the information received by ATSDR. The potential for the presence of radon gas in these structures does exist. If significant levels of radon gas are present in enclosed houses or other buildings, then inhalation of radon gas may pose a public health threat.

ATSDR has prepared, or will prepare, Toxicological Profiles on the site contaminants.

Conclusions and Recommendations

Based upon the information reviewed, ATSDR has concluded that this site is of public health concern because of the risk to human health caused by the

probable human exposure to hazardous substances at concentrations that may result in adverse health effects. As noted in the Potential Environmental and Exposure Pathways Section above, human exposure to heavy metals is probably occurring via ingestion, dermal, or inhalation exposure to contaminated surface soils, mine wastes, surface waters, or contaminated foodstuffs.

Given the public health concerns posed by the Cherokee County-Galena Subsite, all efforts to restrict access to all known contaminated surface soils and mine wastes in residential and non-residential areas should be implemented to prevent exposure to site contaminants. In addition, access should be restricted to the open mine tunnels (shafts) and subsidence areas to prevent exposure to the physical hazards posed by these areas.

Implement procedures to monitor and evaluate migration of airborne contaminants. These procedures should include monitoring of radon gas levels in closed areas in potentially affected residences and buildings. This data is necessary to evaluate the public health implications associated with inhalation of site related contaminants.

Implement measures to control the migration of airborne contaminants. These measures will ensure that nearby receptor populations are not exposed to significant levels of contaminant-laden soil or mine wastes via inhalation.

Identify any private wells, in the subsite area, still being used for drinking water purposes and monitor, if applicable, for heavy metals and radionuclides in order to completely characterize this potential human exposure pathway.

Continued monitoring of treated drinking water, for heavy metals and radionuclides, and maintenance of the installed treatment units, at those residences who had contaminants concentrations in their drinking water above the primary drinking water standards, is needed to protect public health.

Continued monitoring of municipal wells for heavy metals is needed to protect public health. This monitoring should include radionuclides.

Identify any irrigation wells in use in the area and monitor for the heavy metals in order to characterize the potential for bioaccumulation in livestock and their products which are fed potentially contaminated plant materials and/or watered with contaminated surface or ground waters.

Remedial Investigations and Feasibility Studies (RI/FSs) are being planned for other EPA designated subsite areas within the Cherokee County NPL site. Further environmental characterization and sampling of the Cherokee County site, and other impacted areas, during the RI/FSs for the other subsites, should be designed to address the environmental and human exposure pathways discussed above. When additional information and data become available, e.g., the completed RI/FSs, such material will form the basis for further assessment by ATSDR at a later date.